I claim:

1. A method for combustion in a fuel combustion engine which utilizes late direct injection of fuel into a combustion chamber, comprising:

maintaining oxygen concentration in a charge-air mixture for combustion within a desired oxygen concentration range;

compressing the charge-air mixture;

determining the resulting boost pressure of the compressed charge-air mixture;

taking the compressed charge-air mixture into the combustion chamber;

directly injecting a quantity of fuel into the combustion chamber responsive to the determined boost pressure of the compressed charge-air mixture; and

combusting the fuel and charge-air mixture in the combustion chamber.

2. The method of claim 1, wherein the desired oxygen concentration range is a range located somewhere between 10% and 18%.

3. The method of claim 1, wherein the desired oxygen concentration range is a range between 12% and 14%.

4. The method of claim 1, wherein the charge-air mixture is formed by means of a low pressure EGR loop.

5. The method of claim 1, further comprising:

determining the temperature of the compressed charge-air mixture;

matching the quantity of fuel injected into the combustion chamber to the density of the charge-air mixture, as determined from the boost pressure and temperature of the compressed charge-air mixture.

6. The method of claim 5, further comprising regulating the temperature of the compressed charge-air mixture to a desired temperature range.

7. The method of claim 1, further comprising:

determining a demand for power to be produced by the engine;

compressing the charge-air mixture to a desired charge-air boost pressure corresponding to the determined demand for power; and

directly injecting a quantity of fuel into the engine cylinder, in a quantity corresponding to the desired charge-air boost pressure.

8. A method of operating an internal combustion engine, in a motor vehicle, which utilizes direct injection of fuel into a combustion chamber, comprising:

combining recirculated exhaust gas with ambient air to form a charge-air mixture;

adjusting the oxygen concentration of the charge-air mixture, if necessary, to fall within a desired oxygen concentration range;

determining a demand for power to be produced by the internal combustion engine;

determining a desired charge-air boost pressure corresponding to said demand for power;

compressing the charge-air mixture to, or nearer to, the desired charge-air boost pressure;

determining the boost pressure of the compressed charge-air mixture;

taking the compressed charge-air mixture into a cylinder of the engine for combustion;

determining a desired quantity of fuel for combustion corresponding to the determined charge-air boost pressure of the compressed charge-air mixture;

injecting the desired quantity of fuel directly into the engine cylinder; and

combusting the fuel and charge-air mixture within the engine cylinder.

9. The method according to claim 8, wherein the desired oxygen concentration range is a range located somewhere between 10% and 18%.

10. The method of claim 8, wherein the desired oxygen concentration range is a range between 12% and 14%.

11. The method of claim 8, wherein the charge-air mixture is formed by means of a low pressure EGR loop.

12. The method of claim 8, further comprising:

determining the temperature of the compressed charge-air mixture;

matching the desired quantity of fuel injected into the combustion chamber to the density of the charge-air mixture, as determined from the boost pressure and temperature of the compressed charge-air mixture.

13. The method of claim 12, further comprising regulating the temperature of the compressed charge-air mixture to a desired temperature range.

14. A direct injection internal combustion engine, comprising:

a plurality of cylinders, each cylinder providing a combustion chamber;

an exhaust gas recirculation system in operative communication with said cylinders, for combining with ambient air a portion of exhaust gas produced from said combustion chambers to form a charge-air mixture, and returning said charge-air mixture to said cylinders for combustion;

a boost system in operative communication with said exhaust gas recirculation system, for compressing said ambient air or charge-air mixture before taking in said charge-air mixture into said cylinders for combustion;

a fuel injection system in operative communication with the cylinders, for injecting fuel into each of said cylinders for combustion;

a controller for adjusting operation of the exhaust gas recirculation system, boost system and fuel injection system, programmed to:

(1) make adjustments to said exhaust gas recirculation system to control the oxygen concentration of the charge-air mixture to within a target range;

(2) make adjustments to said boost system to control the boost pressure of the charge-air mixture responsive to a demand for power from the engine; and

(3) regulate the amount of fuel injected into each cylinder responsive to the boost pressure of the charge-air mixture.

15. The engine of claim 14, wherein the amount of fuel injected into each cylinder is regulated to be directly responsive to the instant sensed boost pressure, with consideration of charge-air temperature, of the compressed charge-air mixture after compression by the boost system.

16. The engine of claim 14, wherein the target oxygen concentration range is a range located somewhere between 10% and 18%.

17. The engine of claim 14, wherein the target oxygen concentration range is a range between 12% and 14%.

18. The engine of claim 14, wherein the exhaust gas recirculation system forms the charge-air mixture by means of an exhaust exit control valve and low pressure EGR loop.

19. The engine of claim 14, wherein the fuel injection system injects fuel directly into the cylinders late in a compression stroke so as to create stratified, non-premixed combustion.

20. The engine of claim 14, wherein the controller is further programmed to determine the temperature of the compressed charge-air mixture and regulate the amount of fuel injected into each cylinder to the density of the charge-air mixture, as determined from the boost pressure and temperature of the compressed charge-air mixture.

21. The engine of claim 14, wherein the controller is further programmed to regulate the temperature of the compressed charge-air mixture to a desired temperature range.